

Amendments to the Specification:

Please replace the heading at page 1, line 19 with the following amended heading:

The disadvantages of the prior art[[s]]:

Please replace the paragraph beginning at page 3, line 24 with the following amended paragraph:

Fig. 6A is the partial enlargement of the cross-sectional diagram of the ~~heat sink base 7 anchor mechanism 11~~ of the diode of the present invention.

Please add the following new paragraphs after the paragraph beginning at page 3, line 24:

Fig. 7 represents the picture of Fig. 1 with stress applied;

Fig. 7A is the partial enlargement of the cross-section diagram of Fig. 7 after stress applied;

Fig. 8 is the another cross-sectional diagram of the heat sink base 7 of the diode of present invention;

Fig. 8A is the partial enlargement of the cross-sectional diagram of the anchor mechanism 11 of the diode after stress applied and shows the function and effectiveness of the kink 13 of the present invention;

Fig. 9 is the cross-sectional diagram of the preferred embodiment of the present invention, wherein the working temperature of press-fit package exceeds the temperature Tg (Glass Transition Temperature) of the epoxy package 8;

Fig.10 is the cross-sectional diagram of the preferred embodiment of the present invention, wherein the working temperature of press-fit package lower than the temperature Tg (Glass Transition Temperature) of the epoxy package 8.

List of Reference Numerals of the Major Parts

- | | |
|----------|------------------|
| 2 | diode |
| 4 | press-fit region |
| 5 | flat end |
| 6 | connecting means |
| 7 | heat sink base |
| 8 | epoxy package |
| 10 | passivative film |
| 11 | anchor mechanism |
| 12 | shoulder |
| 13 | kink |
| 14 | cup |
| 15a, 15b | solder layers |

- 16 die
- 17 solder platform
- 18 base
- 20 protective sheath
- 21, 21' deformation
- 22 plastic deformation
- 22' micro-mechanical deformation
- 23 complete seal interface
- 24 complete seal interface

Please replace the heading at page 4, line 1 with the following amended heading:

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT
EMBODIMENT

Please add the following new paragraphs after the paragraph beginning at page 4, line 29 and before the paragraph beginning at page 5, line 13:

Fig. 7 is a situation of Fig. 1 (prior art) with stress applied, and stress is generated from the epoxy 8 suffering the heat.

Fig. 7A is the partial enlargement of the cross-section diagram of Fig. 7 after applying stress. As shown in the picture, both deformation 21 and plastic deformation 22 are generated from stress; specifically, plastic deformation 22 may damage the die 16 and affect its electrical characteristics. Of course, the prior art lacks the structure of the kink 13, which is disclosed/invented by the present invention, and cannot avoid this critical damage.

Please replace the paragraph beginning at page 5, line 13 with the following amended paragraph:

Fig. 4 is the cross-sectional diagram of the structure of the preferred embodiment of the diode 2 of the present invention; said diode 2 comprises 2 major parts: a connecting means 6 and a heat sink base 7; one end of said connecting means 6 is a flat end 5 fixed on a die 16 and the other end has no fix shape (not shown); said heat sink base 7 comprises: a base 18 which is at the bottom of said heat sink base 7; a press-fit region 4 which is around said base 18; a solder platform 17 which is located above said base 18 and has an anchor mechanism 11 equipped with a shoulder 12 and a kink 13; a die 16 which has a first side and a second side electrically coupled to said flat-end 5 and said solder platform 17, respectively, and is fixed on said solder platform 17; [[a]] the shoulder 12 which is extended from said solder platform 17 has a via the kink 13; and a cup 14 which is extended upwardly from periphery of said base 18. A protective sheath 20 can be formed after the etching process and the passivant process are finished to enhance its mechanical strength.

Please replace the paragraph beginning at page 5, line 28 with the following amended paragraph:

The present invention surmounts the disadvantages of the prior art and has at least the following five advantages: (1) The etching of the diode 2 is more completely and evenly in the etching process and is easier to clean, thus improving the yield and reducing the cost. This is achieved by adjusting the height of the shoulder 12 to be substantially the same as the die 16. When the height of the shoulder 12 is substantially the same as the die 16, the shoulder 12 would not hinder the circulation of the etching solution. Thus, a more completely and evenly etching can be achieved. (2) It is easier for the passivant process on the interface portion, in other words, the passivant process of fixing the passivative [material] film 10 (for example, polyimide, silicon rubber, silicone gel, etc.) is easier to proceed. This is achieved by the acclivitous shoulder 12. Since the passivative material film 10 can be supported and fixed by the shoulder 12 in the passivant process, the passivant process becomes easier. (3) The present invention can absorb the stress directed to the die 16 generated by the expansion or the shrinkage of the epoxy package 8. This can be achieved by the anchor mechanism 11 equipped with the acclivitous shoulder 12 and the kink 13 especially. More specifically, the epoxy package 8 may suffer from the temperature change and result in the thermal expansion or shrinkage during the different working situations, and the stress is induced accordingly (Referring to Fig. 9 and Fig. 10), such stress will be simultaneously imposed on press-fit package. As happened in the prior art, the stress will cause deformation 21 and plastic deformation 22, wherein plastic deformation 22 exerting to the interface of the die 16 and the solder layers 15a, 15b and causing the damage of the die 16. The damage will affect the electrical characteristics and may generate crack possibly in turns of the silicon material. However, the present invention can avoid the damage as well. The present invention can absorb the stress directed to the die 16 generated by the expansion or the shrinkage. This can be achieved by the combination of the acclivitous shoulder 12 and the kink 13 especially. Because said shoulder 12 and kink 13 can absorb the stress directed to the die 16 generated by the expansion of the epoxy 8 under heat or the shrinkage when the working temperature decreasing, so as to prevent the die 16 from

~~being damaged during the different working situations and to avoid the generation of the gap between the shoulder 12 and the passivative material 10.~~ (4) The present invention can extend the path of the moisture to the die 16, so as to improve the ability of the die 2 against the moisture and to extend the lifecycle of the die 2. Since the kink 13 exists as shown in Fig. 6A, the moisture can not reach the die 16 directly even if it enters the crack between the shoulder 12 and the passivative material film 10. Thus, the ability of the diode 2 against the moisture is better and the lifecycle of the diode is extended. (5) The design of the prior art cannot avoid the generation of the gap between the interface of the epoxy 8, the shoulder 12 and the passivative film 10. However, the present invention can eliminate the gap issue, thus effectively stopping a moisture path. The detailed mechanism and explanation are illustrated as below.

Please replace the paragraph beginning at page 6, line 26 with the following amended paragraph:

Fig. 6 is the cross-sectional diagram of the heat sink base 7 of a diode 2 according to the present invention. It indicates that the height of the cup 14 and the shoulder are substantially the same. Alternatively, the height of the cup 14 can also be higher or lower than the shoulder 12 (not shown). Fig. 6 also indicates the position of the kink 13 anchor mechanism 11.

Please replace the paragraph beginning at page 6, line 31 with the following amended paragraph:

Fig. 6A is the partial enlargement of the cross-sectional diagram of the ~~heat sink base 7~~ anchor mechanism 11 of a diode 2 according to the present invention. It clearly

indicates the partial enlargement of the position where the kink 13 exists. Even if the moisture enters the gap between the shoulder 12 and the passivative material film 10, it can not reach the die 16 directly compared with the conventional semiconductor devices. Thus, the ability of the diode 2 against the moisture is better and the lifecycle of the diode is extended.

Please add the following new paragraphs after the paragraph beginning at page 6 line 31 and before the paragraph beginning at page 7, line 7:

Regarding Figs. 8 and 8A, the present invention is to specially designed a deep V shape of the kink 13 (Referring to Fig. 8A), where the induced stress is the weakest; therefore, the external stress resulted from the temperature change will exert on and extend along the V shape of the shoulder 12 and the kink 13 to the deepest point to release stress, thus micro-mechanical deformation 22' can be eliminated. Finally, any further micro-mechanical deformation would be stop and stress would be absorbed by the total thermal base of the solder platform 17 and the base 18. Contrarily, there is no prior art has ever taught or suggested the deep V shape design of the kink 13. Therefore, induced stress imposes on the shoulder 12 (Referring to Figs. 7 and 7A) and resulting plastic deformation 22 to damage the die 16.

Regarding Figs. 9 and 10, when working temperature of press-fit package exceeds the temperature Tg (Glass Transition Temperature) of the epoxy package 8, there is a thermal expansion stress imposing on the interface of the epoxy package 8 and the cup 14 (Referring to Fig. 9). This is due to the higher thermal expansion coefficient of the epoxy package compared with that of the lower thermal expansion coefficient of the cup 14. As a result, a complete sealing (Referring to complete seal interface 23) is formed along the interface of the epoxy package 8 and the cup 14. Therefore, any would-be gap is totally eliminated. In opposite, when working temperature of press-fit package is lower than the temperature Tg (Glass Transition

Temperature) of the epoxy package 8, there is a thermal shrinkage stress imposing on the interface of the epoxy package 8, the shoulder 12 and the solder platform 17 (Referring to Fig. 10). As a result, a complete sealing (Referring to complete seal interface 24) is formed along the interface of the epoxy package 8, the shoulder 12 and solder platform 17. Again, any would-be gap is totally eliminated. Since the present invention can create complete seal interface 23 and 24 to avoid the generation of the moisture gap so as to improve the ability of the die 16 against the moisture and to extend the lifetime of the die 16.

Please replace the Abstract beginning at page 10, line 1 with the following amended Abstract:

Abstract

The invention related to a diode 2 comprising a connecting means (6) and a heat sink base (7). Said connecting (6) has a flat end (5) fixed on a die 16 and another end without fix shape. Said heat sink base (7) comprises: a base (18) which is at the bottom of said heat sink base (7); a press-fit region (4) which is set around said base (18); a solder platform (17) which is set above said base (18) and has an anchor mechanism (11) equipped with a shoulder (12) and a kink (13); a die (16) which has a first side and a second side electrically coupled to said flat-end (5) and said solder platform (17), respectively, and is fixed on said solder platform (17); [[a]] the shoulder (12) which is extended acclivitously from said solder platform (17), the root of said shoulder connected to said solder platform 17 having a via the kink (13); and a cup (14) which is extended upwardly from the periphery of said base (18).